REMARKS

Claims 1, 43 and 61 have been amended. Claims 2-25 and 66-72 were previously cancelled. Claims 36-42, 54-60 and 64-65 stand withdrawn. New claims 73-91 have been added. Accordingly, claims 1, 26-35, 43-53, 61-63 and 73-91 are currently pending for consideration.

I. **Amendments**:

Claims 1, 43 and 61 were amended to clarify that the first alkalizing step (b) in each respective claim is carried out while keeping an SiO_2 content within the range of from 4.5 to 8% by weight. Support can be found in the specification at page 5, line 36 to page 6, line 2.

New claim 73 depends from claim 1 and recites that the SiO_2 content is kept within the range of from 5.0 to 7.5% by weight in step (b). New claim 74 depends from claim 73 and recites that the alkalization according to (d) produces a sol having an S-value within the range of 20 to 40%. Support for these claims can be found at page 6, lines 2-4.

New claim 75 depends from claim 1 and recites that the alkalization according to (b) produces a sol having a molar ratio of SiO_2 to M_2O, where M is alkali metal or ammonium, within the range of from 20:1 to 80:1. New claim 76 depends from claim 75 and recites that the alkalization according to (b) produces a sol having a molar ratio of SiO_2 to M_2O, where M is alkali metal or ammonium, within the range of from 30:1 to 70:1. Support for these claims can be found at page 5, lines 25-28.

New claim 77 depends from claim 76 and recites that the alkalization according to (d) produces a sol having a molar ratio of SiO_2 to M_2O, where M is alkali metal or ammonium, within the range of from 12:1 to 40:1. New claim 78

depends from claim 77 and recites that the alkalization according to (d) produces a sol having a molar ratio of SiO_2 to M_2O, where M is alkali metal or ammonium, within the range of from 15:1 to 30:1. Support for these claims can be found at page 7, lines 1-4.

New claim 79 depends from claim 78 and recites that the alkalization according to (d) produces a sol having an S-value within the range of 10 to 45%. Support for this claim can be found at page 5, line 36 to page 6, line 2.

New claim 80 depends from claim 43 and recites that the SiO_2 content is kept within the range of from 5.0 to 7.5% by weight in step (b). New claim 81 depends from claim 80 and recites that the alkalization according to (d) produces a sol having an S-value within the range of 20 to 40%. Support for these claims can be found at page 6, lines 2-4.

New claim 82 depends from claim 43 and recites that the alkalization according to (b) produces a sol having a molar ratio of SiO_2 to M_2O, where M is alkali metal or ammonium, within the range of from 20:1 to 80:1. New claim 83 depends from claim 82 and recites that the alkalization according to (b) produces a sol having a molar ratio of SiO_2 to M_2O, where M is alkali metal or ammonium, within the range of from 30:1 to 70:1. Support for these claims can be found at page 5, lines 25-28.

New claim 84 depends from claim 83 and recites that the alkalization according to (d) produces a sol having a molar ratio of SiO_2 to M_2O, where M is alkali metal or ammonium, within the range of from 12:1 to 40:1. New claim 85 depends from claim 84 and recites that the alkalization according to (d) produces a sol having a molar ratio of SiO_2 to M_2O, where M is alkali metal or ammonium, within the range of from 15:1 to 30:1. Support for these claims can be found at page 7, lines 1-4.

New claim 86 depends from claim 85 and recites that the alkalization according to (d) produces a sol having an S-value within the range of 10 to 45%. Support for this claim can be found at page 5, line 36 to page 6, line 2.

New claim 87 depends from claim 61 and recites that the SiO_2 content is kept within the range of from 5.0 to 7.5% by weight in step (b). New claim 88 depends from claim 87 and recites that the alkalization according to (d) produces a sol having an S-value within the range of 20 to 40%. Support for these claims can be found at page 6, lines 2-4.

New claim 89 depends from claim 61 and recites that the alkalization according to (b) produces a sol having a molar ratio of SiO_2 to M_2O, where M is alkali metal or ammonium, within the range of from 20:1 to 80:1. New claim 90 depends from claim 89 and recites that the alkalization according to (b) produces a sol having a molar ratio of SiO_2 to M_2O, where M is alkali metal or ammonium, within the range of from 30:1 to 70:1. Support for these claims can be found at page 5, lines 25-28.

New claim 91 depends from claim 90 and recites that the alkalization according to (d) produces a sol having an S-value within the range of 10 to 45%. Support for this claim can be found at page 5, line 36 to page 6, line 2.

II. **Rejections**:

In the Office Action, claims 1, 26-35, 43-53 and 61-63 were rejected under 35 U.S.C. 103(a) as being unpatentable over Johansson et al. (U.S. Patent No. 5,447,604) (hereinafter "Johansson"), optionally in view of Brekau et al. (U.S. Patent No. 5,458,812) (hereinafter "Brekau"), Vossos (U.S. Patent No. 3,714,064) (hereinafter "Vossos"), Chilton (U.S. Patent No. 3,560,400) (hereinafter "Chilton") and Mindick (U.S. Patent No. 3,502,593) (hereinafter "Mindick"). This rejection is respectfully traversed.

The present invention provides a process for the production of an aqueous sol containing silica-based particles. The process makes it possible to produce silica-based sols with high stability, high specific surface area, low S-values and high solids contents as well as excellent drainage and retention characteristics. Silica-based sols with these characteristics are in demand in the papermaking industry.

For instance, examples 3-5 of the application help illustrate the invention. All of the silica-based sols in these examples show a combination of high stability, high specific surface area, low S-values and high solids contents. As stated in the present specification (see page 3, lines 24-26), the S-value indicates the degree of aggregate formation and microgel formation. A lower S-value is indicative of a higher degree of aggregation of the silica-based particles. The silica-based sols produced according to the claimed invention in example 5b showed a silica content of 20% by weight, an S-value of 37%, and specific surface areas of 700 m^2/g SiO2 and 140 m^2/g aqueous sol. The remaining examples also show products having favorable properties and excellent drainage and retention characteristics.

The criticality of the process steps of the claimed invention is also shown in the examples of the present application, in which example 1 illustrates the production of standard silica sols that are used for comparison and which did not include a second alkalization to a pH of at least 10.0, as required by the claimed invention. The standard silica sols used for comparison (Sol 1a, Sol 1b, and Sol 1c) showed lower specific surface areas and/or silica contents at corresponding S-values and also lower drainage and retention characteristics.

Johansson discloses silica sols and a process for their production. The process of Johansson comprises: (a) acidification of an aqueous alkali water glass solution to a pH of from about 1 to about 4; and (b) alkalization of the acid sol. See col. 2, line 29 to col. 3, line 12 and col. 5, lines 15 to 51 of Johansson.

Johansson teaches that the alkalization of the acid sol is carried out to a molar ratio of SiO_2 to M_2O within the range of 6:1 to 12:1 and that the 12:1 upper limit is essential. See col. 2, lines 54-57 and 10-24 of Johansson. Johansson also teaches that the sol obtained normally will get a pH value above 10.5. See col. 2, lines 56-57 of Johansson.

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the reference itself or in the knowledge generally available to one of ordinary skill in the art, to modify the reference. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all claim limitations. See MPEP §2142.

The teaching or suggestion to make the claimed combination (or modification) and the reasonable expectation of success must both be found in the prior art, and not based on the applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

The initial burden is on the examiner to provide some suggestion of the desirability of doing what the inventor has done. "To support the conclusion that the claimed invention is directed to obvious subject matter, the reference must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." Ex parte Clapp, 227 U.S.P.Q. 972, 973 (Bd. Pat. App. & Inter. 1985).

Johansson does not disclose first and second alkalization steps with an intermediate step of particle growth, as presently claimed. In that regard, Johansson is silent as to a first alkalization step in which the SiO_2 content is kept within the range of from 4.5 to 8 wt%, and which is carried out prior to a separate

particle growth or heat-treating step, as recited in independent claims 1, 43 and 61.

It is respectfully submitted that this claimed range for the SiO_2 content quantifies the first alkalization step. By keeping the SiO_2 content within the claimed range, the S-value of the final sol can be controlled to a desired value. See application at page 5, line 35 to page 6, line 4.

Similarly, with respect to new claims 73-76, 79-83 and 86-91, Johansson is silent as to the claimed SiO_2 content and molar ratio ranges for the first alkalization step, as well as the claimed final S-value ranges.

Applicants' respectfully submit that there is no teaching or suggestion in Johansson to modify its teachings to perform the claimed steps, including the first alkalization step, as discussed above.

Moreover, with respect to claims 33, 51, 61, 77-78 and 84-85, it is respectfully submitted that Johansson teaches away from the claimed invention by teaching a molar ratio of SiO_2 to M_2O within the range of 6:1 to 12:1.

Regarding the other cited references, there is no disclosure or teaching in Brekau, Vossos, Chilton or Mindick, when read alone or together, that would motivate or suggest one of ordinary skill in the art to practice the claimed method that includes first and second alkalization steps, with an intermediate particle growth or heat-treating step, as claimed. It is respectfully submitted that Brekau, Vossos, Chilton and Mindick teach different processes for obtaining different silica sols to be used for different purposes.

More specifically, Brekau discloses a continuous process for the production and concentration of silica sols. The silica particles of the sols of Brekau are non-aggregated (see col. 1, lines 3-7), i.e., they show high S-values. Furthermore, silica particles of the sols of Brekau are generally large; an average

particle size of 9 to 55 nm is stated for the silica particles of reactor 3 (see col. 4, lines 27-34). The specific surface area of the silica particles of Brekau is generally low; 300 m^2/g is reported in example 1 (see col. 5, lines 28-31). Brekau also does not disclose or suggest first and second alkalization steps as claimed according to the present application. In addition, Brekau does not disclose or suggest how to produce an aqueous sol which has a specific surface area of at least 95 m^2/g aqueous sol and contains silica-based particles which have a specific surface area of at least 550 m^2/g SiO_2. Finally, Brekau does not relate to the production of silica sols suitable for use as drainage and retention aids in papermaking.

Vossos discloses aqueous colloidal silica sols which are concentrated, yet are in the form of extremely finely divided, discrete, dense particles and the production thereof (see col. 1, lines 15-18). Thus, Vossos does not relate to producing silica sols having low S-values and containing aggregated silica-based particles. Vossos does not disclose or suggest first and second alkalization steps as claimed according to the present application. In addition, Vossos does not relate to the production of silica sols suitable for use as drainage and retention aids in papermaking.

Chilton discloses a process for the concentration of an aqueous silica sol (see col. 1, lines 54-55). Chilton does not disclose the use of silica sols containing aggregated silica particles, i.e., having low S-values. Furthermore, Chilton discloses the use of large particle size silica particles having low specific surface areas (see the examples of Chilton). In addition, Chilton does not disclose or suggest first and second alkalization steps as claimed according to the present application. Furthermore, Chilton does not disclose or suggest how to produce an aqueous sol which has a specific surface area of at least 95 m^2/g aqueous sol and contains silica-based particles which have a specific surface area of at least 550 m^2/g SiO_2. Finally, Chilton does not relate to the production of silica sols suitable for use as drainage and retention aids in papermaking.

Mindick discloses aqueous silica sols containing particles having an average diameter ranging from 5 to 10 millimicrons (see col. 1, lines 14-16). The silica sols of Mindick contain discrete, dense particles (see col. 1, lines 70-72). Thus, Mindick does not disclose silica sols containing aggregated silica particles, i.e., having low S-values. Mindick also fails to disclose or suggest first and second alkalization steps as claimed according to the present application. Furthermore, Mindick does not disclose or suggest how to produce an aqueous sol which has a specific surface area of at least 95 m^2/g aqueous sol and contains silica-based particles that have a specific surface area of at least 550 m^2/g SiO_2. Finally, Mindick does not relate to the production of silica sols suitable for use as drainage and retention aids in papermaking.

In summary, there is no disclosure or teaching in Johansson that would motivate one of ordinary skill in the art to practice the claimed method that includes first and second alkalization steps, with an intermediate particle growth or heat-treating step, as claimed. Moreover, there is also no disclosure or teaching in Brekau, Vossos, Chilton or Mindick that would alleviate the substantial deficiencies of the Johansson primary reference. Absent impermissible hindsight reliance on the present application, there would be no motivation for one of ordinary skill in the art to arrive at the claimed invention.

Therefore, for the reasons set forth above, it is respectfully requested that the rejections of claims 1, 26-35, 43-53, and 61-63 under 35 U.S.C. 103(a) as being unpatentable over Johansson, optionally in view of Brekau, Vossos, Chilton and Mindick be withdrawn.

III. Conclusion:

Accordingly, Applicants respectfully submit that the application, including claims 1, 26-35, 43-53, 61-63 and 73-91, as amended, is in proper form for allowance, which action is earnestly solicited. If resolution of any remaining issue is required prior to allowance of the application, it is respectfully requested

that the Examiner contact Applicants' undersigned attorney at the telephone number provided below.

Respectfully submitted,

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